

An Indian-Australian research partnership

Project Title: **Engineering amyloid fibrils for nanotechnology and neuronal cell regeneration**

Project Number: **IMURA0207**

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Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?

1. Nanotechnology
2. Biotechnology and stem cell research

The research problem

Amyloid fibrils are one of the important naturally occurring protein materials associated with many diseases such as Alzheimer's and Parkinson's diseases. A variety of protein and peptides with diverse sequences can form amyloid with cross- β -sheet-rich structure. Recent studies have suggested that some amyloids also evolved for performing natural functions of the host organism such as Pmel amyloid in mammalian melanosome and hormones in secretory granules. Amyloids fibrils are very stable, resistance against a wide range of temperature, pH, and proteases. Therefore, engineered amyloids are very attractive candidates for nano-technological applications. Here we propose 1) to engineer novel amyloid fibrils; 2) understanding the mechanism of amyloid fibril formation from monomeric protein and 3) utilize the amyloid fibril scaffolds in conjunction with neural stem cells for regenerating neural pathways in the brain.

Project aims

1. Several peptide and protein will be studied for fibrils formation in vitro. The in vitro experiments will be designed to obtain amyloids with different morphology, biofunctionality and mechanical strength.
2. The different amyloids will be tested for their potential toxicity in vitro. The non-toxic amyloids will be chosen for the study.
3. The amyloids will be tested for neuronal cell regeneration using neural stem cells in vitro.
4. The amyloid based nanomaterials will be tested in vivo using a Parkinson's disease animal model to test the efficacy.

Expected outcomes

The project will lead to the discovery of a novel, non-toxic scaffold for neuronal cell regeneration. Therefore, these nano-materials will be of significant medical value for the treatment of Parkinson's disease and other neurological disorders.